Tumor Scanning with ^{57}Co -Bleomycin

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Since scanning technique was first used to human body, the people who are studying in this intriguing new field have been always researching for radioactive materials which accumulate in malignant tumors selectively. Edwards and Hayes found the accumulation of ^{67}Ga -citrate in the neck lymph nodes of a patient with Hodgkin's disease by a skeletal scintiscan in 1969. Afterwards, it was found that ^{67}Ga -citrate accumulates in various kinds of tumors to some extent. It was also found that ^{67}Ga -citrate accumulates not only in malignant tumors, but also into inflammatory lesion and sarcoidosis.

The authors have been researching since 1969 for some radioactive materials which exclusively accumulate in tumor. In April 1971, the authors reported a fundamental and pharmaceutical study that ^{57}Co -Bleomycin accumulates specifically in tumor of mice. Recently we have found clinically an unusual affinity of ^{57}Co -Bleomycin for malignant tumors. Bleomycin is one of antitumor antibiotics discovered by Umezawa and his collaborators. The chemical formula of Bleomycin has not yet been decided but so far two hexoses and seven amino components have been isolated by acid hydrolysis of Bleomycin- A_2 .

This paper presents a preliminary study on the use of ^{57}Co -Bleomycin for the diagnosis of malignant tumor.

1. Materials and Method

The preparation of ^{57}Co -Bleomycin was as follows: Solution of carrier free $^{57}\text{CoCl}_2$

was added to aqueous solution of Bleomycin, and the pH of this mixture was adjusted to pH 6~7, 320 μCi of ^{57}Co -Bleomycin was administered to the patients intravenously (Specific radioactivity of ^{57}Co -Bleomycin was 64 $\mu\text{Ci}/\text{mg}$). Six hours and 24 hours after the administration, scintigrams were taken respectively with scintiscanner and scinticamera. The ^{57}Co -Bleomycin was administered to 7 patients with tumors which were diagnosed as malignant clinically.

2. Results

Results were shown in Table 1.

Case 1: This patient is a 52-year old woman and had been diagnosed as lung metastasis and the vertebral column metastasis of the operated colon cancer. Twenty-four hours after administration of ^{57}Co -Bleomycin, the lesion of the lung and the vertebra were recognized obviously in scintigram (Figs. 1~4).

Case 2: This 59-year old man had been diagnosed radiographically as lung cancer. The scintigram with ^{57}Co -Bleomycin showed the lung lesion (Figs. 5, 6).

Patient's total body radiation dose was estimated about 10 mrad per 320 μCi of ^{57}Co -Bleomycin. It was found by thin layer radiochromatography that the radioactivity of the patient's urine was originated from only ^{57}Co -Bleomycin and not from inorganic ^{57}Co .

These clinical results show that ^{57}Co -Bleomycin is a valuable scanning agent for the detection of malignant tumor. However, the mechanism of accumulation of ^{57}Co -

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Table 1

		Diagnosis		Finding of scintigram
Case 1	52 ♀	Lung and vertebral metastasis of operated colon cancer	##	The left hilar metastasis was detected (X-film was not shown) (Figs. 1~4)
Case 2	59 ♂	Lung cancer	##	(Figs. 5, 6)
Case 3	39 ♀	Multiple bone metastasis of breast cancer	++	The cranium and vertebral metastasis were detected, but the small ribs metastasis was not recognized
Case 4	72 ♀	Breast cancer with axillar lymphnode metastasis	++	Primary cancer and lymph node metastasis were visualized
Case 5	42 ♀	Operated breast cancer with lung metastasis and pelvis metastasis	++ +	Lung metastasis Pelvis metastasis
Case 6	67 ♂	Oesophageal cancer	±	
Case 7	55 ♂	Reticulosarcoma of skin (Multiple small lesion)	±	

Bleomycin in tumor has not been made clear yet. The accumulation quantity of ^{57}Co -Bleomycin may depend on the histological types of tumors. For the evaluation and theoretical explanation of this material, further many clinical experiments and

researches will be needed.

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